

TECHNICAL INFORMATION






























BLUE-MASTER[®]
by celesa

CUTTING TECHNOLOGIES

SYMBOL INDEX
GENERAL ICONS

 DIN -	DIN Norm	 TQ -	Tolerance	 <i>Plus</i>	High Performance Tool
 ★★	Standard Quality	 ★★★	Professional Quality	 ★★★★	Extra Professional Quality
				 ★★★★★	Supreme Quality
					Premium Quality

MATERIALS


















 HSS	High Speed Steel M2 Quality	 HSSG	High Speed Steel M2 Quality Special heat treatment	 HSS V3	M3:2 Quality 3% Vanadium	 HSS PM	Powder Steel High performance
 HSS M3	High Speed Steel M3:1 Quality	 HSSC 5%	5% Cobalt High Speed Steel. M35 Quality	 HSSCo 8%	8% Cobalt High Speed Steel. M42 Quality	 HCS	Carbon Steel
 SOLID CARBIDE	Solid Carbide	 CARBIDE TIPPED	Carbide Insert	 MG CARBIDE	Carbide Micro Grit		
 ASP	Powder Steel High performance	 ASP 23	Powder Steel High performance C:1,28 Cr:4,1 Mo:5,0 W:6,4 V:3,1	 ASP 60	Powder Steel High performance C:2,30 Cr:4,2 Mo:7,0 Co:10,5 V:6,5 V:3,1	 CV	Carbon Steel with Vanadium
 X210 Cr12	Teatrise Carbon Steel X210 Cr12	 BI	Bimetal	 BI/CoV	Mix: Bimetal/Carbon Vanadium steel	 PCD	Polycrystalline
	Carbide tipped point	 TUNGSTEN	Electroplated Tungsten powder		Irwing drill with carbide Insert		Diamond
 T15	Super Powder Steel C:1,60 Cr:4,0 V:4,9 W:12,0 Co:5,0	 K-10	K10 Carbide Quality	 P-20	P10 Carbide Quality	 Cu-Be	Copper Beryllium

TOOL COATINGS
















 OX	Steamed (Black Oxide)	 BRIGHT	Bright finish	 GOLD	Gold finish	 TiAlN	Titan-Aluminium-Nitride coating for drilling and milling
 TN	Titanium Nitride coating	 TiCN	Titanium Carbonitride coating	 HARD LUBE	High performance friction-reducing coating for tapping	 TiAlN	Supernitride high performance coating for hardened steel tapping 120 kg/mm ²
 CrN	Chrome Nitride coating	 BLUE	Special Blue coating for hardened steel milling	 DIAM	Diamond and Titanium coating for enhanced performance	 TiAlSiN	High performance coating for stainless steel and nickel alloys machining
 HARD P	High hardness coating and resistance to wear and abrasion						

SYMBOL INDEX














POINTS AND HELIX OF DRILLS

	Conventional Point Angle 118°		Split Point		Carbide insert		X Turbo self-centering sharp
	Conventional Sharpening		Split Point		S Sharpening		Carbide Insert for Concrete
	Split Point with Internal Cooling		Triple-Facet sharpening for Stainless Steel		Special All-Road Cut		Chip-Breaker for Stainless Steel Cutting
	Special Point Angle for Hardened Steels 70HRc		Slim Point		Slim Point with Internal Cooling		4 Edges Sharpening
	Square sharpening						

HELIX ANGLES

	Helix Angles for Twist Drills		Helix angle for Reamers		Straight Flute Reamer		Helix angle for Reamers
	Helix angle for 3 Flutes End Mills		Helix angle Multi-Flutes End Mills		Helix angle for 2 Flutes Cutting Centre End Mills		Helix angle for 2 Flutes Ball Nose End Mills
	Helix angle for 2 Flutes End Mills		Variable helix improve performance by reducing vibrations		Helix angle for taps		Helix angle for drill, for wood and metal
	Chip flow A Right hand cut, right hand spiral		Chip flow B Right hand cut, left hand spiral		Chip flow C Right hand cut, double cut left-right hand spiral		

SHANK TYPES

	SDS PLUS shank		SDS-MAX shank		For UNEO type drilling		
	STRAIGHT Straight shank		WELDON Flat Shank		DIN1835B WELDON Shank		Taper Shank
	Anti-slip triple flat shank		Reduced shank for chuck use		Hexagonal shank (1/4" = 6,35 mm)		Hexagonal shank
	GAMMO GAMMON shank		Reduced shank for chuck use				

SYMBOL INDEX
TOOL APPLICATIONS

 IN X Stainless steel: AISI 304, AISI 316, AISI 316L	 IN X Plus High performance tool for stainless steel: AISI 304, AISI316, AISI316L	 Al Aluminium & its alloys	 BRASS Brass
 CAST IRON Nodular, maleable and grey cast iron	 Metal in general: Iron, Construction steel	 Metal up to - Kg/mm ²	 HR c Tempered steel up to..
 PRODUCTION Tool for the production of big series	 HIGH PERFORMANCE Tool for intensive production and big series	 Cu Copper & its alloys	 FORMING Forming tap
 INC INCONEL: Refractory alloy with high nickel content	 Ni Nickel alloy in general	 Ex Suitable for machining in explosive atmospheres	 Ti Titane & its alloys
 Wood in general	 Drill fro Squared Holes in the wood	 Hard Wood	 Plywood
 Nailed wood: palets...	 Chipboard	 Agglomerated (Pressed)	 Sandwich construction
 Laminated partide board	 Plexiglas	 Steel pipes	 Cast iron pipes
 Laminated sheet	 Special saws for tree pruning	 Sheet	 PVC Plastic in general
 Saw blade for curve cutting in wood	 Saw blade for curve cutting in metal	 Fiberglass	 Crystal & glass
 Profiles for windows in Alumium & PVC	 Marble, Granite	 IN X DUPE Excellent wear resistance and very high mechanical resistance Stainless steel	 Uralit
 Cu-Ni-La Non ferreous steel: Copper, Nickel, Brass	 Tile	 Food	 Plastic pipe o flexible rubber insulating materials
 Carton, rubber, leather	 Leather	 Metal profile	 Polystyrene
 Brick	 BLINDADO Armor	 LARGE SERIES High production & performance	 CNC Machines Tool for a CNC use
 Pallets	 Cell Concrete	 Plaster Board	 HARD High hardness and wear and abrasion resistance Steel

SYMBOL INDEX

TOOL APPLICATIONS



Natural wood and other materials



Grooving use exclusively



Plaster



Carbon fiber and composite materials



Hydraulic Hoses Cutting



Hard ceramics



Stoneware



Stone



Reinforced concrete



Tile



White marble



Black marble



Concrete celular



Concrete



Asphalt, pavement.



Calcareous stones



Paving stone, floor tile.



Vault and concrete blocks



Soils



PVC Tubes



Wood strip, profile, skirting, handrail



Explosive atmospheres



Aircraft industry



Scratching and preparation of surfaces



Prepare of a surface for later paint.



Prepare and polish of a surface for later wallpaper or paint



Tile removal



Carpet and adhesive removal

SYMBOL EXPLANATION
CUTTING ANGLES
CENTER DRILLS


DIN333A Norm



DIN333B Norm



DIN333R Norm

COUNTERSINKS


60° Countersink



75° Countersink



90° Countersink



120° Countersink


 60° Multicutting
Countersink

 90° Multicutting
Countersink

 120° Multicutting
Countersink

 90° External
chamfering countersink

 60° external
chamfering countersink

 60° deburring
countersink

 90° deburring
countersink

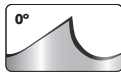
CUTTING ANGLES: END MILLS

 45° isosceles angular
milling cutter

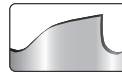
 60° isosceles angular
milling cutter

 90° isosceles angular
milling cutter

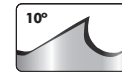

Single angle Mill

CUTTING ANGLES: BAND SAW BLADES


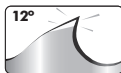
0° Teeth angle



Reinforced teeth



10° Teeth angle



12° Ground tooth angle

END MILLS ROUGHING AND GRIT TYPES OF BAND SAWS

 Fine roughing
NF Type

 Medium roughing
NM Type

 Coarse roughing
NR Type

 Tungsten carbide
electro-deposited
Fine

 Tungsten carbide
electro-deposited
Medium

 Tungsten carbide
electro-deposited
Coarse

CUTTING No.
GENERAL


Teeths N°



Multi cut

END MILLS

 2 Flutes end mills with center
cutting

 3 Flutes end mills with center
cutting

 4 Flutes end mills with center
cutting

 Multi-fluted end mills
with center cutting

 4 Flutes end mills
without center cutting

SYMBOL EXPLANATION

CUTTING N°

REAMERS



3 Fluted Drill Reamer
without cutting centre



Multi-Fluted Drill Reamer
without cutting centre



Solid carbide heat 3 edges

CONSTRUCTION DRILLS

ICONS DEFINITION BY FAMILY

TWIST DRILLS FOR METAL



Left hand drills

DRILL CHUCK



Auto-lock



LIGHT Light weight

TAPS



Taps with pilot for a good
alignment of the first tap



Forming machine taps with oil
grooves



Forming machine taps without
oil grooves



Hand taps for aluminium &
its alloys



Taps alternating teeth
for through holes in the
aluminium



Two flutes machine tap for
blind holes in aluminium



Left-hand cutting

LATHE TOOLS



Square
lathe tool



Cylindrical
lathe tool



Rectangular
lathe tool



Trapezoid
lathe tool



Irregular
trapezoidal
lathe tool

THREAD GAUGES



Thread Profile



C1:16 Threading conicity NPT
(1/16)



Certificate

JIG SAW BLADES



Ground tooth profile



Carbide tipped tooth



Reverse cut: Good finishing
in the backside



Teeth type

SCREWDRIVER BITS



Phillips



Pozidriv



Slot



Torx



Torx round



Robertson



Torx Tamper



Hexagonal



Tri Wing



Xzn

SAW BLADES & DRILLS FOR CONSTRUCTION



Water cooling



Dry work



Percussion mode



Rotation mode without
percussion

CHART OF REVOLUTIONS PER MINUTE (R.P.M.) ACCORDING TO THE DIAMETER OF THE DRILL
CUTTING SPEED DRILL Ø AND REVOLUTIONS PER MINUTE

C _s (m/min)	2	2,5	3	4	5	6,5	8	10	13	16	20	25	30	40	50	63	80
3	477	382	318	238	190	147	119	95	73	60	48	38	32	24	19	15	12
5	796	636	530	398	318	245	198	159	122	99	80	64	53	40	32	25	20
8	1.273	1.018	848	636	509	392	318	254	195	159	127	102	85	64	50	40	32
10	1.592	1.273	1.061	795	636	490	398	318	245	199	159	127	106	80	64	50	40
12	1.910	1.528	1.273	955	764	588	477	382	294	238	190	152	127	95	76	60	48
15	2.387	1.910	1.592	1.194	955	735	596	477	367	298	138	190	159	119	95	75	60
20	3.183	2.546	2.122	1.592	1.273	979	795	636	490	398	318	255	212	159	127	101	80
25	3.979	3.183	2.652	1.989	1.592	1.224	995	795	612	497	398	318	165	198	159	126	99
30	4.775	3.820	3.183	2.387	1.910	1.469	1.194	995	735	596	477	382	318	238	190	151	119
35	5.570	4.456	3.714	2.785	2.228	1.714	1.393	1.114	857	696	557	445	371	278	222	176	139
40	6.366	5.092	4.245	3.183	2.456	1.958	1.592	1.273	979	795	636	509	424	318	255	202	159
45	7.162	5.730	4.775	3.581	2.865	2.204	1.790	1.432	1.102	895	716	572	477	358	286	227	179
50	7.958	6.366	5.305	3.978	3.183	2.448	1.990	1.592	1.224	995	795	636	530	398	318	252	198
55	8.754	7.002	5.836	4.376	3.501	2.693	2.188	1.750	1.346	1.094	875	700	584	438	350	277	218
60	9.550	7.639	6.366	4.775	3.820	2.938	2.388	1.910	1.469	1.194	955	764	636	477	382	303	238
70	11.142	8.912	7.428	5.570	4.456	3.428	2.785	2.228	1.714	1.392	1.114	891	742	557	445	354	278
75	11.937	9.549	7.958	5.968	4.775	3.672	2.981	2.387	1.836	1.492	1.194	955	795	594	477	378	298
80	12.732	10.185	8.488	6.366	5.092	3.918	3.183	2.546	1.958	1.592	1.273	1.018	848	636	509	404	318
90	14.324	11.459	9.550	7.162	5.730	4.407	1.581	2.865	2.204	1.790	1.432	1.145	955	716	572	455	358
100	15.915	12.732	10.611	7.958	6.366	4.897	3.978	3.183	2.448	1.989	1.592	1.273	1.061	795	636	505	398

FEED CHART

Ø mm	A	B	C	D	E	F
2,0	0,020	0,025	0,032	0,040	0,050	0,063
2,5	0,025	0,032	0,040	0,050	0,063	0,080
3,0	0,030	0,040	0,050	0,060	0,080	0,100
4,0	0,040	0,050	0,063	0,080	0,100	0,125
5,0	0,040	0,050	0,063	0,080	0,100	0,125
6,5	0,050	0,063	0,080	0,100	0,125	0,160
8,0	0,063	0,080	0,100	0,125	0,160	0,200
10,0	0,080	0,100	0,125	0,160	0,200	0,250
13,0	0,090	0,110	0,130	0,180	0,220	0,270
16,0	0,100	0,125	0,160	0,200	0,250	0,315
20,0	0,125	0,160	0,200	0,250	0,315	0,400
25,0	0,160	0,200	0,250	0,315	0,100	0,500
30,0	0,160	0,200	0,250	0,315	0,100	0,500
40,0	0,200	0,250	0,315	0,400	0,500	0,630
50,0	0,250	0,315	0,400	0,500	0,630	0,800
63,0	0,315	0,400	0,500	0,630	0,800	1,000
80,0	0,400	0,500	0,630	0,800	1,000	1,250

NOTICE: These values are guidance, valid under the following conditions of use

Constant drilling advance

Use of drills of dimensions according to DIN 338 or DIN 345

HSS or HSSCo qualities

Maximum drilling length equal to three times the drill diameter

Good stability and rigidity in the power tool and in the clamping of the piece.

Without pilot pins.

Good refrigeration (coolant, flow, pressure)

Vertical drilling and incoming and outgoing of the drill perpendicular to the surface

In the case the above-mentioned conditions are not fulfilled the cutting speed and / or the feed values must be modified, reducing or increasing them.

CUTTING SPEED CONDITIONS FOR COUNTERSINKS



MATERIAL	Steel <700 N/mm ²	Steel >700 N/mm ²	Steel 1000 N/mm ²	Cast Iron <250 N/mm ²	Cast Iron >250 N/mm ²	Stainless Steel <1000 N/mm ²	Soft Brass	Hard Brass	Aluminium < 11 %	Soft Plastic	Hard Plastic
COOLANTS	X	X	X	X	X	X	X	X	X	Water	Air
Cs (m/min)	15	10	6	12	8	6	20	15	25	20	15
Diam. mm	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.	U/min R.P.M.
4,3	1100	740	440	890	590	444	1480	1110	1850	1480	1110
5,0	950	640	380	760	510	382	1270	950	1590	1270	950
5,3	900	600	360	720	480	360	1200	900	1500	1200	900
5,8	820	550	330	660	440	329	1100	820	1370	1100	820
6,0	800	530	320	640	420	318	1060	800	1330	1060	800
6,3	760	510	300	610	400	303	1010	760	1260	1010	760
7,0	680	450	270	550	360	273	910	680	1140	910	680
7,3	650	440	260	520	350	262	870	650	1090	870	650
8,0	600	400	240	480	320	239	800	600	990	800	600
8,3	580	380	230	460	310	230	770	580	960	770	580
9,4	510	340	200	410	270	203	680	510	850	680	510
10,0	480	320	190	380	250	191	640	480	800	640	480
10,4	460	310	180	370	240	184	610	460	770	610	460
11,5	420	280	170	330	220	166	550	420	690	550	420
12,4	390	260	150	310	210	154	510	390	640	510	390
13,4	360	240	140	290	190	143	480	360	590	480	360
14,4	340	220	130	270	170	133	450	320	550	450	320
15,0	320	210	130	250	170	127	420	320	530	420	320
16,5	290	190	120	230	150	116	390	290	480	390	290
19,0	250	170	100	200	130	101	340	250	420	340	250
20,5	230	160	90	190	120	93	310	230	360	310	230
23,0	210	140	80	170	110	83	280	210	350	280	210
25,0	190	130	80	150	100	76	250	190	320	250	190
26,0	180	120	70	150	100	73	240	180	310	240	180
28,0	170	110	70	140	90	68	230	170	280	230	170
30,0	160	110	60	130	80	64	210	160	270	210	160
31,0	150	100	60	120	80	62	210	150	260	210	150
32,0	150	100	60	120	80	60	210	150	260	210	150
34,0	140	90	60	110	70	56	190	140	230	190	140
37,0	130	90	50	100	70	52	170	130	220	170	130
40,0	120	80	50	100	60	48	160	150	200	160	120
50,0	100	60	40	80	50	38	130	100	160	130	100
63,0	80	50	30	60	40	30	100	80	130	100	80
80,0	60	40	20	50	30	24	80	60	100	80	60

CONVERSION FORMULA

$$R.P.M = \frac{Cs \times 1.000}{\varnothing \times TT}$$

$$Cs = \frac{R.P.M \times \varnothing \times TT}{1.000}$$

R.P.M. = REVOLUTION PER MINUTE

Cs. = CUTTING SPEED IN METER/MIN

∅ = DRILL DIAMETER

÷ = 3,1416

EXAMPLE :

-Material : ALUMINIUM

-ALU < 11%

-Drill ∅: 10 mm

-Cs: 25 m / min (Chart)

$$R.P.M : \frac{Cs \times 1.000}{\varnothing \times TT} = \frac{25 \times 1.000}{10 \times TT} = 800$$

CUTTING CONDITIONS FOR HSS / HSS-CO / ASP END MILLS

	Hardness (N/m ²)	Ø Mill (mm)	Cutting speed (m./min.)	Feed Teeth Fz (mm)	Coated end mills
BUILDING STEELS	< 400	4 - 8		0.01 - 0.03	
		8 - 12	--38 - 42	0.03 - 0.05	
		12 - 20		0.05 - 0.07	
		20 - 32	65 - 75	0.07 - 0.10	
		32 - 50		0.10 - 0.12	
ALLOYED STEEL	< 700	--4 - 8		0.01 - 0.04	
		8 - 12	32-36	0.04 - 0.05	
		12 - 20		0.05 - 0.07	
		20 - 32	55-65	0.07 - 0.10	
		32 - 50		0.10 - 0.12	
ALLOYED STEEL	< 950	4 - 8		0.02 - 0.04	
		8 - 12	30 - 34	0.04 - 0.05	
		12 - 20		0.05 - 0.07	
		20 - 32	50 - 60	0.07 - 0.09	
		32 - 50		0.09 - 0.11	
ALLOYED STEEL	< 1400	4 - 8		0.01 - 0.03	
		8 - 12	16 - 20	0.03 - 0.04	
		12 - 20		0.04 - 0.06	
		20 - 32	30 - 40	0.06 - 0.07	
		32 - 50		0.07 - 0.09	
STAINLESS STEELS	< 700	4 - 8		0.01 - 0.03	
		8 - 12	14 - 18	0.03 - 0.05	
		12 - 20		0.05 - 0.07	
		20 - 32	22 - 26	0.07 - 0.10	
		32 - 50		0.10 - 0.13	
CAST IRON	100 - 800	4 - 8		0.02 - 0.04	
		8 - 12	20 - 24	0.04 - 0.06	
		12 - 20		0.06 - 0.08	
		20 - 32	38 - 42	0.08 - 0.11	
		32 - 50		0.11 - 0.13	
ALUMINIUM ALLOY (SI<10%)	140 - 610	4 - 8		0.03 - 0.06	
		8 - 12	100 - 150	0.06 - 0.07	
		12 - 20		0.07 - 0.10	
		20 - 32	150 - 200	0.10 - 0.14	
		32 - 50		0.14 - 0.17	
ALUMINIUM ALLOY (SI>10%)	160 - 420	4 - 8		0.03 - 0.06	
		8 - 12	60 - 100	0.06 - 0.08	
		12 - 20		0.08 - 0.11	
		20 - 32	80 - 120	0.11 - 0.15	
		32 - 50		0.15 - 0.19	
LONG CHIP BRASS-BRONZE	< 500	4 - 8		0.01 - 0.03	
		8 - 12	50 - 70	0.03 - 0.05	
		12 - 20		0.05 - 0.08	
		20 - 32	80 - 120	0.08 - 0.09	
		32 - 50		0.09 - 0.11	
TITANIUM ALLOY	< 1100	4 - 8		0.01 - 0.03	
		8 - 12	12 - 16	0.03 - 0.05	
		12 - 20		0.05 - 0.07	
		20 - 32	22 - 26	0.07 - 0.09	
		32 - 50		0.09 - 0.10	
REFRACTORY ALLOYS CO, NI	< 1100	4 - 8		0.01 - 0.03	
		8 - 12	6 - 14	0.03 - 0.05	
		12 - 20		0.05 - 0.07	
		20 - 32	12 - 24	0.07 - 0.09	
		32 - 50		0.09 - 0.10	

CONVERSION FORMULA

$$\text{R.P.M.} = \frac{\text{Cs} \times 1.000}{\text{TT} \times \text{Ø}}$$

$$\text{FEED SPEED} = \text{R.P.M.} \times \text{Z} \times \text{Fz (mm/min.)}$$

R.P.M. = REVOLUTIONS PER MINUTE

Cs. = CUTTING SPEED (m./min.)

Ø = END MILL DIAMETER

TT = 3,1416

Z = TEETH N°

Fz = FEED x TEETH

CUTTING CONDITIONS FOR CARBIDE END MILLS

	Hardness (N/m ²)	Ø Mill (mm)	Cutting speed (m./min.)	Feed Teeth Fz (mm)
BUILDING STEELS	< 400	2 - 4		0.01 - 0.02
		4 - 8	80 - 120	0.02 - 0.05
		8 - 12	96 - 144	0.05 - 0.06
		12 - 16		0.06 - 0.08
		16 - 25		0.08 - 0.10
ALLOYED STEEL	< 700	2 - 4		0.01 - 0.02
		4 - 8	60 - 100	0.02 - 0.04
		8 - 12	72 - 120	0.04 - 0.05
		12 - 16		0.05 - 0.06
		16 - 25		0.06 - 0.08
ALLOYED STEEL	< 950	2 - 4		0.01 - 0.02
		4 - 8	60 - 80	0.02 - 0.04
		8 - 12	72 - 96	0.04 - 0.05
		12 - 16		0.05 - 0.06
		16 - 25		0.06 - 0.08
ALLOYED STEEL	< 1400	2 - 4		0.005 - 0.015
		4 - 8	20 - 60	0.015 - 0.02
		8 - 12	24 - 72	0.02 - 0.03
		12 - 16		0.03 - 0.05
		16 - 25		0.05 - 0.08
STAINLESS STEELS	< 700	2 - 4		0.005 - 0.015
		4 - 8	40 - 80	0.015 - 0.02
		8 - 12	48 - 96	0.02 - 0.03
		12 - 16		0.03 - 0.05
		16 - 25		0.05 - 0.08
CAST IRON	100 - 800	2 - 4		0.01 - 0.03
		4 - 8	50 - 100	0.03 - 0.05
		8 - 12	60 - 120	0.05 - 0.06
		12 - 16		0.06 - 0.08
		16 - 25		0.08 - 0.12
ALUMINIUM ALLOY (SI < 10%)	140 - 610	2 - 4		0.02 - 0.05
		4 - 8	240 - 400	0.05 - 0.08
		8 - 12	290 - 480	0.08 - 0.12
		12 - 16		0.12 - 0.15
		16 - 25		0.15 - 0.20
ALUMINIUM ALLOY (SI > 10%)	160 - 420	2 - 4		0.02 - 0.05
		4 - 8	125 - 300	0.05 - 0.08
		8 - 12	150 - 360	0.08 - 0.12
		12 - 16		0.12 - 0.15
		16 - 25		0.15 - 0.20
LONG CHIP BRASS - BRONZE	< 500	2 - 4		0.15 - 0.03
		4 - 8	100 - 200	0.03 - 0.04
		8 - 12	120 - 240	0.04 - 0.06
		12 - 16		0.06 - 0.08
		16 - 25		0.08 - 0.10
TITANIUM ALLOY	< 1100	2 - 4		0.005 - 0.015
		4 - 8	20 - 40	0.015 - 0.02
		8 - 12	24 - 48	0.02 - 0.03
		12 - 16		0.03 - 0.05
		16 - 25		0.05 - 0.08
REFRACTORY ALLOYS CO, NI	< 1100	2 - 4		0.005 - 0.015
		4 - 8	20 - 50	0.015 - 0.02
		8 - 12	24 - 60	0.02 - 0.03
		12 - 16		0.03 - 0.05
		16 - 25		0.05 - 0.08

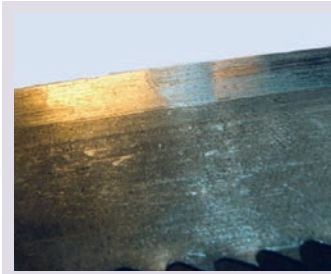
Coated end mills

CONVERSION FORMULA

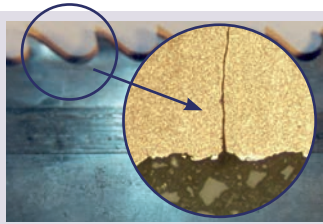
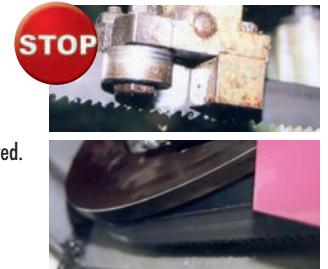
$$R.P.M. = \frac{Cs \times 1.000}{TT \times \emptyset}$$

FEED SPEED = R.P.M. x Z x Fz (mm/min.)

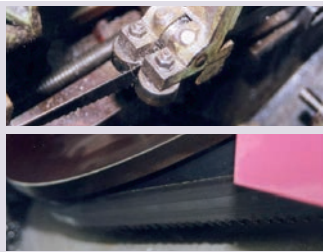
R.P.M. = REVOLUTIONS PER MINUTE
 Cs. = CUTTING SPEED (m./min.)
 Ø = END MILL DIAMETER
 TT = 3,1416
 Z = TEETH N°
 Fz = FEED x TEETH

BAND SAW BLADES TROUBLESHOOTER AND CLAIM ACCEPTANCE

**CRACKS
ORIGINATING
FROM THE BACK
EDGE**
Causes:

- Guides are faulty (crushing the back).
- The back edge of the blade is touching the rolling guides.
- Blade to tightly fitted in the machine's arm guide when mounted.

NON-ACCEPTABLE CLAIM

**CRACKS
ORIGINATING
FROM THE TOOTH**
Causes:

- Tooth pitch is too short: chips get stuffed.
- Tooth pitch is too large: excessive vibrations.
- Feeding is too high in comparison with cutting speed.

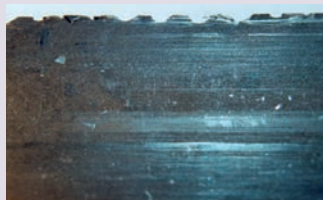
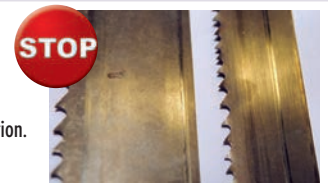
NON-ACCEPTABLE CLAIM

**STREAK
ON THE BACK**
Causes:

- Back rolling guide is faulty.
- The back edge of the blade is touching the rolling guides.

NON-ACCEPTABLE CLAIM

**DEEP SCRATCH
ON THE SIDES OF
THE BLADE**
Causes:

- Lateral guides are faulty.
- Tooth pitch is too large: excessive vibrations.
- Cutting speed is not adapted to the material (too high).
- The work piece isn't sufficiently fastened during the cutting operation.

NON-ACCEPTABLE CLAIM

**BROCKEN OR
CRUSHED TOOTH**
Causes:

- Tooth pitch is too short: chips get stuffed.
- Tooth pitch is too large: excessive vibrations.
- Cutting speed is not adapted to the material (too high).
- The work piece isn't sufficiently fastened during the cutting operation.

NON-ACCEPTABLE CLAIM

CLEAR BREACH AT WELDING POINT
Causes:

- Manufacturing default: faulty welding.

ACCEPTABLE CLAIM

**BROKEN BLADE,
TOOTH IN OPPOSITE
DIRECTION**
Causes:

- Lateral guides too tight.
- Saw guide arms too far apart from piece.
- Wheels and groups of guides are not aligned.

NON-ACCEPTABLE CLAIM

UNSTRAIGHT CUT
Causes:

- Normal tooth wear.
- Cutting speed and feed are not adapted to the material.
- The tooth pattern is rubbing against the guide side.




NON-ACCEPTABLE CLAIM


IDENTIFICATION OF THE TYPES OF CIRCULAR SAW BLADES

TYPE OF ABRASIVE

- A**: Aluminium Oxide
- AX**: High Resistance Aluminium Oxide
- AC**: Aluminium Oxide and Silicon Carbide
- C**: Silicon Carbide
- Z**: Zirconium

SHAPE OF THE CIRCULAR SAW BLADE

-  **T 41**
Flat for cutting
-  **T 42**
Centre low-profiled for cutting
-  **T 27**
Centre low-profiled flap for polishing

AX 60 SBF T41

GRAIN

- 30-36**: Medium
- 40-60**: Fine
- 80-120**: Extra fine

HARDNESS

- Q**: Soft
- R**: Medium
- S**: Hard

TYPE OF CIRCULAR SAW BLADE (BINDER)

- BF**: Fibre-reinforced resin bond



90°

Circular Saw Blades for
Cutting



15°

Circular Saw Blades for
Polishing and Roughing



Iron, Sulphur and Chloride free

A: Aluminium Oxide.

The aluminium oxide is resistant and durable, for cutting and roughing of high-resistance materials as carbon steel, stainless steel and all type of metals.

AX: High-Resistance Aluminium Oxide

The high-resistance aluminium oxide is a top class abrasive, its grain microstructure allows its breaking when cutting and roughing and generating multiple cutting edges. It is typically used in high production and hardness. Recommended for stainless steel, carbon steel and forged steel.

AC: Aluminium Oxide + Silicon Carbide

C: Silicon Carbide:

The Silicon Carbide is the hardest and sharpest mineral. It is ideal for cutting, sanding and polishing all kind of materials, non-ferrous metals: aluminium, brass, bronze, rubber, glass, plastics, fibrous wood, enamel... The silicon carbide is superior to any other abrasive concerning its penetration and cutting capacity, faster and with less effort.

Z: Zirconium:

The zirconium self-sharpening quality allows a long working life in high performance works and materials disposal. It is ideal for high performance roughing and polishing in stainless steel, steel carbon and all kind of materials.

HOW TO DIFFERENTIATE THE ABRASIVE CIRCULAR SAW BLADES

The abrasive circular saw blades cut, polish and rough with different force due to the abrasive grains that compound them, and joint together because of the binder. According to this material and the binder they have different variations of hardness, speed, cut depth and wear resistance.

Based on these parameters the components must be selected with the specific characteristics for cut, polish or rough according to the application and the material of the piece. Whether it be due to the type of tool to be used (angle grinder, grooving machine, slitting machine or fixed machine), by the material to cut (metal, stainless steel, steel, stone) or by the operation (cut or rough) the characteristics of the circular saw blade will be different for an optimum performance.

AB 05:

Abrasive Circular Saw blade for general use in metal cutting. Diameters of 115mm and 125mm. Flat Centre geometry (T41), composed of Aluminium Oxide. Metallic set of 10 units for a perfect conservation.



AB 11:

High performance Abrasive Circular Saw blade for stainless steel, steel and metal cutting. Diameters of 115mm, 125mm and 230mm. Available in two disc geometries; Flat Centre geometry (T41) and Depressed Centre (T42). High hardness, made in high resistance Aluminium Oxide fiber resin. OSA certificate guaranteed.

AB 17:

STONE. High performance Abrasive Circular Saw blade for construction materials cutting. . Diameters of 115mm, 125mm and 230mm. Depressed Centre (T42) disc geometry. Medium hardness. Manufactured in Silicon Carbide fiber resin. OSA certificate guaranteed.



AB 18:

MULTIFUNCTION. High performance Abrasive Circular Saw blade for all kind of materials. . Diameters of 115mm, 125mm and 230mm. Flat Centre geometry (T41). Soft hardness. Manufactured in Aluminium Oxide + Silicon Carbide fiber resin. OSA certificate guaranteed.

AB 15:

High performance Flap Abrasive Circular Saw blade for stainless steel, steel and metal polishing. Diameters of 115mm and 125mm. Depressed Centre geometry with flaps for polishing (T27). Four grain qualities. Manufactured in zirconium joined to flaps of reinforced fiber-glass for a maximum productivity and security. Front working of the disc at a maximum angle of 15°.



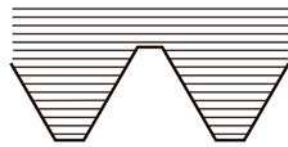
AB 20:

High performance Flap Abrasive Circular Saw blade for roughing and polishing of stainless steel, steel and metal. Diameters of 115mm and 125mm. Depressed Centre geometry with flaps for polishing (T27). Four grain qualities available. Manufactured in Aluminium Oxide. Light, flexible and noiseless due to its multi-layer body. Front working of the disc at a maximum angle of 15°.

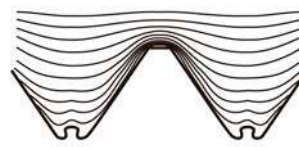
FORMING TAPPING

One of the methods to make threads is the forming thread tapping
This method can be used in materials having a minimum ductility of 10%

ADVANTAGES	USING CONDITIONS
<ul style="list-style-type: none"> - No chip generation during the tapping process - Better surface finish on the flanks - Homogeneous thread perfectly calibrated - Stronger thread able to support higher torque - Higher tool lifetime - Higher speed - Higher productivity 	<ul style="list-style-type: none"> - Accurate prior hole diameter - Plenty of lubrication - RPM's High Enough



Thread obtained with a metal cutting tap





Thread obtained with a forming tap


GEOMETRY OF THE MACHINE TAPS ACCORDING TO THE NORM

RANGE	POINT	SQUARE
M3-M6 DIN 371 M3-M6 DIN 376 M3-M6 DIN 374 M3-M6 DIN 352 M3-M6 DIN 2181 M3-M6 DIN 357 M3-M10 DIN 2174	ENTIRE POINT 	EXTERNAL ENTIRE POINT
M8; M10 DIN 371 M7; M12 DIN 376	REDUCED POINT 	CHAMFER
M7; M9 DIN 371 ≥ M14 DIN 376 ≥ M7 DIN 374 ≥ M7 DIN 352 ≥ M7 DIN 2181 ≥ M7 DIN 357 ≥ M12 DIN 2174	INTERNAL CENTRE POINT 	INTERNAL CENTRE POINT


DIE THREADING RECOMMENDED EXTERNAL DIAMETER


M		
$\varnothing d_1$	p	
M 1	0,25	0,97
M 1,1	0,25	1,07
M 1,2	0,25	1,17
M 1,4	0,3	1,36
M 1,6	0,35	1,54
M (1,7)	0,35	1,64
M 1,8	0,35	1,74
M 2	0,4	1,93
M 2,2	0,45	2,13
M (2,3)	0,4	2,23
M 2,5	0,45	2,43
M (2,6)	0,45	2,53
M 3	0,5	2,92
M 3,5	0,6	3,41
M 4	0,7	3,91
M 4,5	0,75	4,41
M 5	0,8	4,90
M 6	1	5,88
M 7	1	6,88
M 8	1,25	7,87
M 9	1,25	8,87
M 10	1,5	9,85
M 11	1,5	10,85
M 12	1,75	11,83
M 14	2	13,82
M 16	2	15,82
M 18	2,5	17,79
M 20	2,5	19,79
M 22	2,5	21,79
M 24	3	23,77
M 27	3	26,77
M 30	3,5	29,73
M 33	3,5	32,73
M 36	4	35,70
M 39	4	38,70
M 42	4,5	41,69
M 45	4,5	44,69
M 48	5	47,66
M 52	5	51,66
M 56	5,5	55,65
M 60	5,5	59,65
M 64	6	63,62
M 68	6	67,62
M 3 x	0,6	2,91
M 3,5 x	0,75	3,41
M 4 x	0,75	3,91
M 5 x	0,9	4,89


MF		
$\varnothing d_1$	x p	
M 3 x	0,35	2,94
M 3,5 x	0,35	3,44
M 4 x	0,35	3,94
M 4 x	0,5	3,93
M 5 x	0,5	4,93
M 6 x	0,5	5,93
M 6 x	0,75	5,90
M 7 x	0,75	6,90
M 8 x	0,5	7,93
M 8 x	0,75	7,90
M 8 x	1	7,88
M 9 x	1	8,88
M 10 x	0,5	9,93
M 10 x	0,75	9,90
M 10 x	1	9,88
M 10 x	1,25	9,86
M 11 x	1	10,88
M 12 x	0,75	11,90
M 12 x	1	11,88
M 12 x	1,25	11,86
M 12 x	1,5	11,85
M 13 x	1	12,88
M 13 x	1,5	12,85
M 14 x	1	13,88
M 14 x	1,25	13,86
M 14 x	1,5	13,85
M 15 x	1	14,88
M 15 x	1,5	14,85
M 16 x	1	15,88
M 16 x	1,5	15,85
M 18 x	1	17,88
M 18 x	1,5	17,85
M 18 x	2	17,82
M 20 x	1	19,88
M 20 x	1,5	19,85
M 20 x	2	19,82
M 22 x	1	21,88
M 22 x	1,5	21,85
M 22 x	2	21,82
M 24 x	1	23,88
M 24 x	1,5	23,85
M 24 x	2	23,82


MF		
$\varnothing d_1$	x p	
M 25 x	1	24,88
M 25 x	1,5	24,85
M 26 x	1	25,88
M 26 x	1,5	25,85
M 27 x	1	26,88
M 27 x	1,5	26,85
M 27 x	2	26,82
M 28 x	1,5	27,85
M 28 x	2	27,82
M 30 x	1	29,88
M 30 x	1,5	29,85
M 30 x	2	29,82
M 32 x	1,5	31,85
M 33 x	1,5	32,85
M 33 x	2	32,82
M 34 x	1,5	33,85
M 35 x	1,5	34,85
M 36 x	1,5	35,85
M 36 x	2	35,82
M 36 x	3	35,76
M 38 x	1,5	37,85
M 39 x	1,5	38,85
M 39 x	2	38,82
M 39 x	3	38,76
M 40 x	1,5	39,85
M 40 x	2	39,82
M 40 x	3	39,76
M 42 x	1,5	41,85
M 42 x	2	41,82
M 42 x	3	41,76
M 45 x	1,5	44,85
M 45 x	2	44,82
M 45 x	3	44,76
M 48 x	1,5	47,85
M 48 x	2	47,82
M 48 x	3	47,76
M 50 x	1,5	49,85
M 50 x	2	49,82
M 50 x	3	49,76
M 52 x	1,5	51,85
M 52 x	2	51,82
M 52 x	3	51,76


W (BSW)			
$\varnothing d_1$	p		
W 3/32	48		2,26
W 1/8	40		3,12
W 5/32	32		3,82
W 3/16	24		4,69
W 7/32	24		5,39
W 1/4	20		6,16
W 5/16	18		7,76
W 3/8	16		9,30
W 7/16	14		10,89
W 1/2	12		12,43
W 9/16	12		13,92
W 5/8	11		15,62
W 3/4	10		18,76
W 7/8	9		21,89
W 1	8		25,08
W 1 1/8	7		28,21
W 1 1/4	7		31,35
W 1 3/8	6		34,48
W 1 1/2	6		37,67
W 1 3/4	5		43,94
W 2	4,5		50,26


BSF			
$\varnothing d_1$	p		
BSF 3/16	32		4,67
BSF 1/4	26		6,25
BSF 5/16	22		7,82
BSF 3/8	20		9,39
BSF 7/16	18		10,97
BSF 1/2	16		12,54
BSF 9/16	16		14,12
BSF 5/8	14		15,71
BSF 3/4	12		18,85
BSF 7/8	11		22,02
BSF 1	10		25,17

UNC		
$\varnothing d_1$	- p	
No. 1 - 64 UNC		1,79
No. 2 - 56 UNC		2,12
No. 3 - 48 UNC		2,44
No. 4 - 40 UNC		2,76
No. 5 - 40 UNC		3,09
No. 6 - 32 UNC		3,41
No. 8 - 32 UNC		4,07
No. 10 - 24 UNC		4,71
No. 12 - 24 UNC		5,37
1/4 - 20 UNC		6,22
5/16 - 18 UNC		7,80
3/8 - 16 UNC		9,37
7/16 - 14 UNC		10,95
1/2 - 13 UNC		12,52
9/16 - 12 UNC		14,10
5/8 - 11 UNC		15,68
3/4 - 10 UNC		18,84
7/8 - 9 UNC		22
1 - 8 UNC		25,16
1 1/8 - 7 UNC		28,31
1 1/4 - 7 UNC		31,49
1 3/8 - 6 UNC		34,63
1 1/2 - 6 UNC		37,81
1 3/4 - 5 UNC		44,12
2 - 4,5 UNC		50,45

UNF		
$\varnothing d_1$	- p	
No. 0 - 80 UNF		1,47
No. 1 - 72 UNF		1,79
No. 2 - 64 UNF		2,12
No. 3 - 56 UNF		2,44
No. 4 - 48 UNF		2,77
No. 5 - 44 UNF		3,10
No. 6 - 40 UNF		3,42
No. 8 - 36 UNF		4,08
No. 10 - 32 UNF		4,73
No. 12 - 28 UNF		5,38
1/4 - 28 UNF		6,24
5/16 - 24 UNF		7,82
3/8 - 24 UNF		9,41
7/16 - 20 UNF		10,98
1/2 - 20 UNF		12,56
9/16 - 18 UNF		14,14
5/8 - 18 UNF		15,73
3/4 - 16 UNF		18,89
7/8 - 14 UNF		22,05
1 - 12 UNF		25,21
1 1/8 - 12 UNF		28,38
1 1/4 - 12 UNF		31,56
1 3/8 - 12 UNF		34,73
1 1/2 - 12 UNF		37,91

G (BSP)			
$\varnothing d_1$	p		
G 1/16	28		7,61
G 1/8	28		9,62
G 1/4	19		13,03
G 3/8	19		16,53
G 1/2	14		20,81
G 5/8	14		22,77
G 3/4	14		26,30
G 7/8	14		30,06
G 1	11		33,07
G 1 1/8	11		37,71
G 1 1/4	11		41,73
G 1 3/8	11		44,14
G 1 1/2	11		47,62
G 1 3/4	11		53,56
G 2	11		59,43

NPSM			
$\varnothing d_1$	p		
1/8 NPSM	27		4,99
1/4 NPSM	18		13,24
3/8 NPSM	18		16,70
1/2 NPSM	14		20,77
3/4 NPSM	14		26,13
1 NPSM	11,5		32,68
1 1/4 NPSM	11,5		41,45
1 1/2 NPSM	11,5		47,52
2 NPSM	11,5		59,56

PG			
$\varnothing d_1$	p		
PG 7	20		12,40
PG 9	18		15,10
PG 11	18		18,50
PG 13,5	18		20,30
PG 16	18		22,40
PG 21	16		28,15
PG 29	16		36,85
PG 36	16		46,85
PG 42	16		53,85
PG 48	16		59,15

THREAD TYPE IDENTIFICATION AND EQUIVALENCIES

ROSCA Ø	AMERICAN THREADS							ENGLISH THREAD					
	Ø mm	UNC (NC)	UNF (NF)	UNEF (NEF)	UN	UNS	NPS NPT API	BSW	BSF	BRASS	SBS 6n	WHIT	BSP BSPT
1/16	1,588	--	--	--	--	--	27	60	--	--	--	--	--
3/32	2,381	--	--	--	--	--	--	48	--	--	--	--	--
1/8	3,175	--	--	--	--	--	27	40	--	--	--	--	28
5/32	3,969	--	--	--	--	--	--	32	--	--	--	--	--
3/16	4,763	--	--	--	--	--	--	24	32	--	--	--	--
7/32	5,556	--	--	--	--	--	--	24	28	--	--	--	--
No 0		--	80	--	--	--	--	--	--	--	--	--	--
No 1	1,854	64	72	--	--	--	--	--	--	--	--	--	--
No 2	2,184	56	64	--	--	--	--	--	--	--	--	--	--
No 3	2,515	48	56	--	--	--	--	--	--	--	--	--	--
No 4	2,845	40	48	--	--	--	--	--	--	--	--	--	--
No 5	3,175	40	44	--	--	--	--	--	--	--	--	--	--
No 6	3,505	32	40	--	--	--	--	--	--	--	--	--	--
No 8	4,166	32	36	--	--	--	--	--	--	--	--	--	--
No 10	4,826	24	32	--	--	28-36-40-48-56	--	--	--	--	--	--	--
No 12	5,486	24	28	32	--	36-40-48-56	--	--	--	--	--	--	--
1/4	6,350	20	28	32	--	24-27-36-40-48-56	18	20	26	26	--	32	19
9/32	7,14	--	--	--	--	--	--	20	26	--	--	--	--
5/16	7,938	18	24	32	20-28	27-36-40-48	--	18	22	26	--	32	--
3/8	9,525	16	24	32	20-28	18-27-36-40	18	16	20	26	--	32	19
7/16	11,11	14	20	28	16-32	18-24-27	--	14	18	26	--	--	--
1/2	12,7	13	20	28	16-32	12-14-18-24-27	14	12	16	26	18	20	14
9/16	14,29	12	18	24	16-20-28-32	14-27	--	12	16	26	--	20	--
5/8	15,87	11	18	24	12-16-20-28-32	14-27	--	11	14	26	18	20	14
11/16	17,46	--	--	24	12-16-20-28-32	--	--	11	14	26	--	16-20	--
3/4	19,05	10	16	20	12-28-32	14-18-24-27	14	10	12	26	16	16-20	14
13/16	20,64	--	--	20	12-16-28-32	--	--	10	12	--	--	16-20-26	--
7/8	22,22	9	14	20	12-16-28-32	10-18-24-27	--	9	11	26	--	20	14
15/16	23,81	--	--	20	12-16-28-32	--	--	--	--	--	--	12-20	--
1"	25,40	8	12	20	16-28-32	10-14-18-24-27	11/2	8	10	26	16	12-20	11
1" 1/16	26,98	--	--	18	8-12-16-20-28	--	--	--	--	--	--	12-20	--
1" 1/8	28,57	7	12	18	8-16-20-28	10-14-24	--	7	9	26	--	12-20	11
1" 3/16	30,16	--	--	18	8-12-16-20-28	--	--	--	--	--	--	12-20	--
1" 1/4	31,75	7	12	18	8-16-20-28	10-14-24	11/2	7	9	26	16	12-20	11
1" 5/16	33,34	--	--	18	8-12-16-20-28	--	--	--	--	--	--	12-20	--
1" 3/8	34,92	6	12	18	8-16-20-28	10-14-24	--	6	8	--	--	12-20	11
1" 7/16	36,51	--	--	18	6-8-12-16-20-28	--	--	--	--	--	--	12-20	--
1" 1/2	38,10	6	12	18	8-16-20-28	10-14-24	11/2	6	8	26	14	12-20	11
1" 9/16	39,69	--	--	18	6-8-12-16-20-28	--	--	--	--	--	--	--	--
1" 5/8	41,27	--	--	18	6-8-12-16-20	--	--	5	8	26	--	12-16-20	11
1" 11/16	42,86	--	--	18	6-8-12-16-20	--	--	--	--	--	--	--	--
1" 3/4	44,45	5	--	--	6-8-12-16-20	10-14-18	--	5	7	26	--	12-16-20	11
1" 13/16	46,04	--	--	--	6-8-12-16-20	--	--	--	--	--	--	--	--
1" 7/8	47,62	--	--	--	6-8-12-16-20	10-14-18	--	4 1/2	--	26	--	12-16-20	--
1" 15/16	49,21	--	--	--	6-8-12-16-20	--	--	--	--	--	--	--	--
2"	50,80	4 1/2	--	--	6-8-12-16-20	10-14-18	11 1/2	4 1/2	7	26	14	12-16-20	11

EQUIVALENCES BETWEEN PITCHES IN INCHES AND METRIC

N	mm	N	mm	N	mm	N	mm
80	0,317	28	0,907	13	1,953	4 1/2	5,644
72	0,352	27	0,940	12	2,116	4	6,349
64	0,396	26	0,976	11 1/2	2,208	3 1/2	7,257
60	0,423	24	1,058	11	2,309	3 1/4	7,815
56	0,453	22	1,154	10	2,540	3	8,466
48	0,529	20	1,270	9	2,822	2 7/8	8,834
44	0,577	19	1,336	8	3,174	2 3/4	9,236
40	0,635	18	1,411	7	3,628	2 5/8	9,676
36	0,705	16	1,587	6	4,233	2 1/2	10,160
32	0,793	14	1,814	5	5,080	---	---